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IS 638 (1979): Sheet Rubber Jointing and Rubber Insertion  
Jointing [PCD 13: Rubber and Rubber Products]



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*Indian Standard*  
SPECIFICATION FOR  
SHEET RUBBER JOINTING AND  
RUBBER INSERTION JOINTING  
( *Second Revision* )

UDC 621.762.4 : 678.4 : 621.643.412



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**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# *Indian Standard*

## SPECIFICATION FOR SHEET RUBBER JOINTING AND RUBBER INSERTION JOINTING ( *Second Revision* )

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*Indian Standard*  
**SPECIFICATION FOR  
SHEET RUBBER JOINTING AND  
RUBBER INSERTION JOINTING**  
*( Second Revision )*

**0. FOREWORD**

**0.1** This Indian Standard ( Second Revision ) was adopted by the Indian Standards Institution on 1 March 1979, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

**0.2** This standard was first published in 1955 and was subsequently revised in 1965. The time for accelerated ageing prescribed in the first revision was very long. Consequently in this second revision the time for accelerated ageing has been brought down to 72 hours from 240 hours by suitably modifying the requirement on the basis of investigations done. Further, only two types are covered in this second revision, having hardness of 50 to 65 and 66 to 80 IRHD respectively. On the basis of technological improvements, requirements for tensile strength and elongation at break of the rubber have been upgraded. The tests for resistance to heat and moist heat have been removed as it was felt that accelerated ageing test was sufficient to check the quality of rubber used. 0.8 mm thick jointings have also been included in this revision.

**0.3** This standard contains clauses **3.3, 4.1, 4.2, 6.1** and **A-1.3** which call for agreement between the purchaser and the supplier.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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\*Rules for rounding off numerical values ( revised ).

## 1. SCOPE

**1.1** This standard prescribes the requirements and the methods of sampling and test for sheet rubber jointing and rubber insertion jointing for use between flanges and similar joints subjected to water pressure, air pressure or low pressure steam.

NOTE — The recommended low pressure steam is up to  $350 \text{ kN/m}^2$  ( approximately  $3.5 \text{ kgf/cm}^2$  ).

## 2. TYPES AND GRADES

**2.1 Types** — This standard covers the following two types of sheet rubber jointings and rubber insertion jointings depending upon the hardness of rubber, namely:

- a) *Type A* — 50 to 65 Hardness in IRHD, and
- b) *Type B* — 66 to 80 Hardness in IRHD.

**2.2 Grades** — This standard prescribes two grades, namely, Grade 1 and Grade 2 for each of the two types differing in the requirements for various physical characteristics prescribed later in the standard.

## 3. REQUIREMENTS

### 3.1 Material

**3.1.1 Jointing Material** — The jointing shall be made of one of the following materials as may be specified:

- a) Sheet rubber, or
- b) Sheet rubber reinforced with fabric ( rubber insertion jointing ).

**3.1.2 Composition of Rubber Compound** — The material used for the manufacture of the sheet rubber jointing and the rubber insertion jointing shall be natural or synthetic rubber or a blend thereof, suitably compounded and vulcanized having the degree of hardness as specified under 2.1.

**3.1.3 Fabric Reinforcement for Rubber Insertion Jointing** — The reinforcing fabric used for rubber insertion jointing shall have a minimum breaking load of  $120 \text{ N/cm}$  ( approx  $12 \text{ kgf/cm}$  ) width for both warp and weft direction when tested in accordance with IS : 1969-1968\*.

NOTE — The supplier shall supply a square metre of fabric used in the manufacture of rubber insertion jointing for the test.

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\*Methods for determination of breaking load and elongation at break of woven fabrics ( *first revision* ).



### 3.2 Construction and Workmanship

**3.2.1** The sheet rubber jointing or rubber insertion jointing shall be free from surface defects, such as pitting, blemishes and other irregularities and the rubber used in both shall be homogeneous and be free from porosity and grit as judged visually on surface or any cut-surface of the test sample.

**3.2.2 Thickness and Number of Plies** — The thickness of jointing, the tolerance permissible and the number of reinforcement fabric plies ( for rubber insertion jointing ) shall be as given in Table 1.

**TABLE 1 THICKNESS AND NUMBER OF FABRIC PLIES**

THICKNESS OF SHEET RUBBER JOINTING OR RUBBER INSERTION JOINTING	TOLERANCE ON THICKNESS	NUMBER OF PLIES IN RUBBER INSER- TION JOINTING
(1)	(2)	(3)
mm	mm	
0.8	$\pm 0.2$	1
1.5	$\pm 0.2$	1
<u>3</u>	$\pm 0.3$	2
5	$\pm 0.5$	2
6	$\pm 0.6$	3
8 and above	$\pm 0.7$	4

**3.2.2.1 Position of plies** — In the case of rubber insertion jointing containing three or more plies of fabric, they shall be so placed within the thickness of the jointing that the rubber layers between the plies are of approximately same thickness.

**3.2.2.2** Each outer layer of rubber shall be not less than 0.8 mm thick in all insertions containing two or more plies of fabric. The outer layers of rubber shall in all cases be of equal thickness.

**3.3 Size of Sheet Rubber Jointing and Rubber Insertion Jointing** — Unless specified otherwise, the sheet rubber jointing and rubber insertion jointing for sizes up to 6 mm thickness shall be supplied in one piece of 1 × 10 metres and for sizes above 6 mm thickness the minimum length shall be as agreed to between the purchaser and the supplier.

**3.4 Tensile Strength and Elongation at Break** — The tensile strength and elongation at break of sheet rubber jointing and rubber used in insertion jointing used for joints subjected to water and air pressure and

joints subjected to steam pressure when tested according to IS : 3400 (Part I)-1977\* shall be as given in Table 2.

**TABLE 2 TENSILE STRENGTH AND ELONGATION AT BREAK OF SHEET RUBBER JOINTING AND RUBBER USED IN INSERTION JOINTING**

( Clause 3.4 )

SL No.	TYPE	JOINTS SUBJECTED TO WATER AND AIR PRESSURE				JOINTS SUBJECTED TO STEAM PRESSURE			
		Tensile Strength MN/m <sup>2</sup> ( approx kgf/cm <sup>2</sup> ), Min		Elongation at Break Percent, Min		Tensile Strength MN/m <sup>2</sup> ( Approx kgf/cm <sup>2</sup> ), Min		Elongation at Break Percent, Min	
		Grade 1	Grade 2	Grade 1	Grade 2	Grade 1	Grade 2	Grade 1	Grade 2
		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)	(2)								
i)	A	8.5 ( 85 )	6 ( 60 )	400	350	12 ( 120 )	7 ( 70 )	450	400
ii)	B	8.5 ( 85 )	6 ( 60 )	300	250	12 ( 120 )	7 ( 70 )	350	300

### 3.5 Accelerated Ageing

**3.5.1 Jointing to be Used for Joints Subjected to Water and Air Pressure** — After ageing at  $70 \pm 1^\circ\text{C}$  for a period of 72 hours in accordance with IS : 3400 ( Part IV )-1978† the sheet rubber jointing and rubber used in insertion jointing shall not vary by more than  $\pm_{15}^{+10}$  percent for tensile strength and  $\pm_{15}^{+5}$  percent for elongation at break of the corresponding values obtained before ageing when tested according to the method prescribed in IS : 3400 ( Part I )-1977\*.

**3.5.2 Jointing to be Used for Joints Subjected to Steam Pressure** — The ageing shall be done at  $100 \pm 1^\circ\text{C}$  for 72 hours in accordance with IS : 3400 ( Part IV )-1978†. The sheet rubber jointing and rubber used in insertion jointing shall not vary by more than  $\pm_{25}^{+10}$  percent for tensile strength and  $\pm_{35}^{+10}$  percent for elongation at break of the corresponding values obtained before ageing when tested according to the method prescribed in IS : 3400 ( Part I )-1977\*.

\*Methods of test for vulcanized rubbers: Part I Tensile stress-strain properties (first revision).

†Methods of test for vulcanized rubbers: Part IV Accelerated ageing (first revision).

### 3.6 Compression Set

**3.6.1 Jointing to be Used for Joints Subjected to Water and Air Pressure** — The compression set determined in accordance with IS : 3400 ( Part X )-1977\* at  $27 \pm 1^\circ\text{C}$  for  $24 \pm \frac{0}{2}$  hours shall not exceed 35 percent.

**3.6.2 Jointing to be Used for Joints Subjected to Steam Pressure** — The compression set determined in accordance with IS : 3400 ( Part X )-1977\* at  $100 \pm 1^\circ\text{C}$  for  $24 \pm \frac{0}{2}$  hours shall not exceed 35 percent.

**3.7 Resistance to Bending** — There shall be no visible signs of cracking of the surfaces or separation of rubber from the fabric (in case of rubber insertion jointing) when subjected to bending test given in 3.7.1.

**3.7.1** Fold a strip of test piece, 50 mm in width and not less than 100 mm long, round a metal rod, the diameter of which shall equal to the thickness of the sheet rubber or rubber insertion jointing under test. Clamp the jointing in a vice until the inner surface is as shown in Fig. 1, and the distance of the underside of the rod above the vice is equal to the thickness of the jointing under test. Keep it in this position for five minutes and note whether any change occurs in the test specimen.

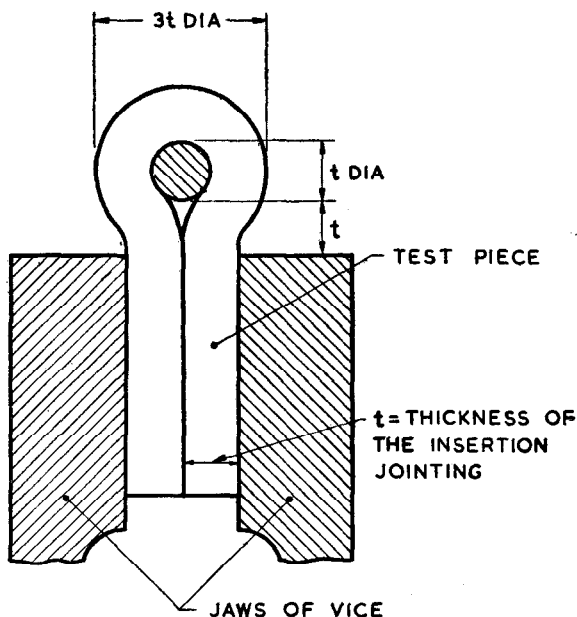


FIG. 1 APPLIANCE FOR BENDING TEST

\*Methods of test for vulcanized rubbers: Part X Compression set at constant-strain (first revision).

**3.8 Adhesion** — For rubber insertion jointing, the adhesion between the rubber plies and fabric plies shall be such that the rate of separation shall not exceed 25 mm per minute under a load of 4 kg, when subjected to adhesion test in accordance with IS : 3400 ( Part V )-1965\*.

**3.9 Hardness** — The hardness on a 10-mm thick test slab tested in accordance with IS : 3400 ( Part II )-1965† shall comply with the requirements prescribed under 2.1.

#### 4. MARKING AND PACKING

**4.1 Marking** — Each piece of sheet rubber jointing or rubber insertion jointing shall be indelibly marked in a suitable position with:

- a) the type, grade and thickness;
- b) the month and year of manufacture, if specified by the purchaser; and
- c) the purpose for which it is intended ( water, steam or air ).

**4.1.1** Each piece of sheet rubber jointing or rubber insertion jointing may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

**4.2 Packing** — The material shall be packed as agreed to between the purchaser and the supplier.

#### 5. SAMPLING AND CRITERIA FOR CONFORMITY

**5.1 Scale of Sampling** — For the purpose of ascertaining conformity of the material to this specification the scale of sampling and criteria for conformity shall be as prescribed in Appendix A.

#### 6. TESTING

**6.1** Unless otherwise agreed to between the purchaser and the supplier, all tests shall be carried out within three months of the receipt of the material by the purchaser.

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\*Methods of test for vulcanized rubbers: Part V Adhesion of rubbers to textile fabrics.

†Methods of test for vulcanized rubbers: Part II Hardness.

**6.2** For all types of sheet rubber jointings or rubber insertion jointings, a sample,  $450 \times 300$  mm, shall be required for testing.

**6.3** Since it is not possible to conduct all the tests on finished rubber sheet, it is necessary that supplier shall submit two test slabs of rubber of the same quality, having the same composition and vulcanized to the same degree of hardness as the finished product to conduct the tests.

## APPENDIX A

( Clause 5.1 )

### SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

#### A-1. SAMPLING OF SHEET RUBBER JOINTINGS AND RUBBER INSERTION JOINTINGS

**A-1.1 Lot** — In any consignment all sheet rubber jointings or rubber insertion jointings made from the same material, of same thickness, type and grade and manufactured under essentially similar conditions of manufacture shall be grouped together to constitute a lot.

**A-1.2** Tests for the determination of the conformity of the lot to the requirements of this specification shall be carried out for each lot separately. The number of sheet rubber jointings or rubber insertion jointings to be selected shall be in accordance with col 1 and 2 of Table 3.

**A-1.3** These sheet rubber jointings or rubber insertion jointings shall be selected at random from the lot. To ensure the randomness of selection, a random number table, as agreed to between the purchaser and the supplier, shall be used. In case such a table is not available, the following procedure shall be adopted:

Starting from any sheet rubber jointing or rubber insertion jointing, count them as 1, 2, 3,....., etc, up to  $r$  and so on in one order, where  $r$  is the integral part of  $N/n$ . Every  $r$ th sheet rubber jointing or rubber insertion jointing thus counted shall be withdrawn to give the sample for test.

#### A-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

**A-2.1** Tests for construction and workmanship and size of sheet rubber jointings or rubber insertion jointings shall be carried out on each of the sheet rubber jointings or rubber insertion jointings selected in **A-1.3**.

The lot shall be considered as having satisfied these requirements if the number of defective sheet rubber jointings or rubber insertion jointings does not exceed the permissible number of defectives given in col 3 of Table 3. A sheet rubber jointing or rubber insertion jointing shall be considered as defective if it fails to satisfy any of these requirements.

**TABLE 3 SCALE OF SAMPLING**( *Clauses A-1.2 and A-2.1* )

NUMBER OF SHEET RUBBER JOINTINGS OR RUBBER INSERTION JOINTINGS IN THE LOT <i>N</i>	NUMBER OF SHEET RUBBER JOINTINGS OR RUBBER INSERTION JOINTINGS TO BE SELECTED <i>n</i>	PERMISSIBLE NUMBER OF DEFECTIVES
(1)	(2)	(3)
Up to 500	8	0
501 „ 1 000	13	1
1 001 „ 3 000	32	1
3 001 and above	50	2

**A-2.2** Tests for the requirements other than those given under **A-2.1** shall be carried out only if the lot is found satisfactory in **A-2.1**, otherwise the lot shall be rejected without further testing. These tests shall be carried out preferably on the test pieces taken from one of the sheet rubber jointings or rubber insertion jointings which have been tested in **A-2.1** and found satisfactory with respect to those requirements, otherwise on the test pieces supplied by the supplier. At least one test shall be carried out for each of these requirements. The lot shall be considered as having satisfied all these requirements if each of the test pieces tested satisfies the relevant requirement.

**A-2.2.1** If the test piece fails to comply with any specified test, two additional sets of test pieces shall be drawn and subjected to that test. The lot shall be considered as having satisfied the requirement if both the test pieces pass the test.

**A-2.3** The lot shall be considered as having satisfied all the requirements of this specification if it passes in **A-2.1** and **A-2.2**, other-wise not.

( Continued from page 2 )

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# INDIAN STANDARDS

ON

## GENERAL RUBBER PRODUCTS

IS:

- 637-1965 Rubber tubings for general purposes (*first revision*)
- ✓ 638-1979 Sheet rubber jointing and rubber insertion jointing (*second revision*)
- 1741-1960 Latex foam rubber products
- 1867-1975 Rubber hot water bottles (*first revision*)
- 3565-1966 Rubber teats for feeding bottles
- 3692-1975 Rubber closures ( pharmaceutical ) (*first revision*)
- 3701-1966 Rubber protective sheaths ( condoms )
- 3867-1966 Rubber ice bags
- 4135-1974 Hospital rubber sheetings (*first revision*)
- 4148-1967 Surgical rubber gloves
- 4149-1967 Post-mortem rubber gloves
- 4770-1968 Rubber gloves for electrical purposes
- 5079-1969 Rubber valve-tubing for cycle tube valves
- 5192-1975 Vulcanized rubber compounds (*first revision*)
- 5193-1969 Rubber sealing rings for domestic fruit vegetable preserving jars
- 5270-1969 Rubber grommets for general purposes
- 5382-1969 Rubber sealing rings for gas mains, water mains and sewers
- 5424-1969 Rubber mats for electrical purposes
- 5680-1969 Rubber tubing for medical use
- 5783-1970 Rubber ward-dressing and porter's gloves
- 6058-1970 Rubber components for transfusion fluid bottles
- 6407-1971 Rubber aprons for hospital use
- 6450-1971 Rubber for dairy industry
- 6693-1972 Ebonite
- 7352-1974 X-ray lead-rubber protective aprons
- 7450-1974 Vulcanized styrene butadiene rubber ( SBR ) based compounds
- 7466-1974 Rubber gaskets for pressure cookers
- 7523-1974 Rubber catheter ( urinary )
- 8164-1976 Hospital Rubber sheeting ( without reinforcing fabric )